# An Account of some new Species, Varieties, and Monstrous Forms of Medusæ.—II. By George J. Romanes, M.A., F.L.S., &c.

[Read January 18, 1877.]

(Plates XV. & XVI.)

In my previous communication on this subject (Journ. Linn. Soc., Zool. vol. xii. pp. 525–531) I omitted to give any drawings of the new species of Medusæ which I described. On the present occasion, therefore, I supply this omission by representing in Plate XV. such of the previously described Medusæ as are undoubtedly entitled to rank as new species. These are the three species of the genus *Tiaropsis*, viz. those represented in figs. 1, 3, and 4. The Plate also contains figures of the two species of *Thaumantias* (figs. 2 and 5) which I happened to meet with last summer. There can be no doubt that these are true species; and for them I propose the name *T. crucifera* and *T. helicobostrycha**.

Proceeding now to describe the monstrous forms of Medusæ which have this year fallen within my observation, I have, in the first place, to reiterate the surprise which I expressed in my previous paper at the extreme rarity of such forms—so far, at least, as the naked-eyed group are concerned. Looking to the lowly type of organization which the Medusæ present, remembering how prone these animals are to exhibit the phenomenon of gemmation, and considering that even in much higher animals so-called "vegetative reproduction of similar parts" is a process of comparatively frequent occurrence, considering these points, I think we should be prepared to expect the Medusæ to present us with numerous examples of monstrous or misshapen forms. Yet so far is this from being the case that this year, as last year, I have only met with one solitary instance of departure from the normal type among the many thousands of naked-eyed Medusæ which I observed. This instance again occurred in the genus *Sarsia*; but, unlike the monstrosity described in my former paper, in which there were six complete segments, in the present instance there were

* In my former paper I assigned to a probably new species the name *Bougainvillea fruticosa*. Having since ascertained that this name had already been appropriated by Prof. Allman to designate another species of the same genus, I will now substitute for it the name *B. Allmanii*.

only five segments. These, however, were all complete and exactly equal to one another.

In the case of *Aurelia aurita* deviations from the normal type are of frequent occurrence. It is remarkable, however, as pointed out in my former paper, that such deviations nearly always take place in the direction either of multiplication or of abortion of *entire segments.* As I have this year paid particular attention to this subject, I will here describe all the more noteworthy forms of variation which I have observed: and to render my description intelligible, it is necessary to begin by describing the normal type.

Fig. 6 (Pl. XV.) represents *Aurelia aurita* in full diastole, with its manubrium removed. It will be observed that the organism is constructed on what we may metaphorically term a very definite plan. The ovaries are four in number, equal in size, and arranged symmetrically round the centre of the animal. The lithocysts, or ganglia, are eight in number, and are disposed round the margin of the animal at points equidistant from one another. These eight organs thus bear a very precise geometrical relation to the four central organs; and this relation is, as it were, mapped out by the distribution of the radial tubes. For it may he observed by a glance at the diagram that although most of the nutrient tubes branch and anastomose as they proceed from the centre to the circumference of the umbrella, there is a marked exception to this mode of distribution in the case of some of these tubes—those, namely, which proceed from the centre to the circumference in perfectly straight or radial lines without branching. Moreover, closer inspection will show that these radial or unbranching tubes are disposed with perfect symmetry. For one such tube passes radially to each of the eight marginal ganglia, and each of the eight segments of the circle thus marked out is bisected by another radial or unbranched tube. There are thus altogether sixteen radial or unbranched tubes, which serve to mark out the whole umbrella into as many equal segments. It must further be observed that those straight tubes which proceed to the marginal ganglia differ from those which alternate with them in being less deeply coloured. Lastly, I may add that in the normal type of *Aurelia* the manubrium (which is not represented in the figures) presents four equal lobes.

Such being the normal type of *Aurelia*, the following are the more important deviations from it which I have observed. The most usual is that which I described in my former paper, and which is here represented in fig. 7 (Pl. XV.). It will be seen that all parts of the organism have undergone multiplication in a common ratio; so that the effect is to "increase the *number* whilst adhering to the *type* of the natural segments above alluded to," and this without in the least degree destroying the general symmetry of the animal. In such cases the manubrium is usually six-lobed. In other cases, however, some one or more of the normal segments do not take part in the multiplication; so that while the number of segments are increased and their natural type conformed to, the animal nevertheless, as a whole, becomes asymmetrical. Of such a case fig. 8 (Pl. XV.) may be taken as an example.

It will be observed that in the last figured specimen the ovaries were not affected by the process of multiplication, although this had affected both the manubrium and the segments of the umbella. Such an immunity from the abnormal process in question is frequently presented, both by the ovaries and by the manubrium, even in cases where it has affected the umbrella to a large extent. This may be seen in fig. 9 (Pl. XV.), where it is also worth while to observe the *symmetrical* manner in which the multiplying process has affected the umbrella regarded as a whole. In fig. 1 (Pl. XVI.) we have an exactly similar case, except that the multiplying process has failed to extend to one of the quadrants of the umbrella.

In some cases the multiplication of parts takes place on one side of the umbrella only, as may be seen in figs. 2 and 3 (Pl. XVI.). In the first of these specimens one of the ovaries has become duplicated; and all the other parts in its segment having done the same, the manubrium presented five lobes, and the umbrella ten segments. In fig. 3 one of the ovaries has become tripled; and the other parts of the umbrella being multiplied in the same manner, the total number of segments is twelve. The manubrium, however, in this case only presented the same number of lobes as in the last one.

Abortion of parts in *Aurelia* takes place in the same symmetrical way as does multiplication of parts. For instance, in fig. 4 (Pl. XVI.) it is observable that one ovary is absent, while the segments of the umbrella are reduced to six. Similarly, in fig. 5 (Pl. XVI.) the ovaries and segments of the umbrella are reduced to one half of the normal number. In neither of these specimens, however, was the manubrium affected by the reducing process.

I have now given a sufficient number of illustrations to render an accurate idea of the various ways in which the normal type of *Aurelia* is seen to be modified by the multiplication and the suppression of parts. The most remarkable point with regard to such cases is the strictly symmetrical manner in which the abnormal developments or abortions are usually found to occur. In most cases these developments, or abortions, extend proportionally to all parts of the organism. In other cases this is not so; and of these cases the most numerous are those in which the ovaries and manubrium are unaffected, while the segments of the umbrella are multiplied. In some cases, on the other hand, a deficiency or absence of the ovaries entails no corresponding deficiency or absence of any of the other organs. Lastly, it may be added that in every case of multiplication of segments which I have ever seen, the supernumerary lithocysts always occurred at the end of a faintly coloured radial tube, and never at the end of a strongly coloured one. Whether the marked difference in the coloration of the two sets of radial tubes implies any corresponding difference in their physiological functions, is a point which I have not been able to ascertain; but if such is the case, I should be inclined to suspect, from the uniform rule just mentioned, that whatever peculiarity of function it is which renders necessary the high coloration of the radial tubes that alternate with the lithocysts, is a peculiarity which is incompatible with the presence of a lithocyst at the end of the tube.

From the additional observations detailed in this paper, it will be evident that no stress is to be laid on the fact of the *most usual* form of multiplication of parts in *Aurelia* being proportionally the same as that which appears to be the *most usual* form of multiplication in *Sarsia* (see former paper, p. 529).

This year, as last year, I observed "that towards the end of August all the individuals of this species (i. e. *Aurelia aurita*) began to undergo a marked diminution in size." In my previous communication I expressed myself in favour of the view that this progressive diminution in the size of individuals composing the incoming generations of *Aurelia* was due to the increasing numbers of a parasitical Crustacean (*Hyperia galba*), "which appeared to devour with avidity all the coloured parts of their hosts." There can, I still think, be little doubt that such parasites, by impairing or destroying the nutritive system of these Medusæ, must hinder, or entirely stop, the growth of the latter; but that the small size of *Aurelia* towards the end of the season is not to be attributed to this cause alone, I have during the present autumn obtained satisfactory evidence. For this year the numbers of *Hyperia galba* were not nearly so great as they were last year; so that I am now better able to determine how much of the effect which we are considering is to be attributed to their influence. And forasmuch as I observed that towards the end of the season the Medusæ were of small size, whether or not they were infested by the parasites in question, I conclude that causes other than the one which I previously mentioned must be chiefly concerned in producing this effect.

## DESCRIPTION OF PLATES.

### Plate XV.

Fig. 1. *Tiaropsis indicans*, n. sp. Natural size.

2. *Thaumantias crucifera*, n. sp. Natural size.

3. *Tiaropsis polydiademata*, n. sp. Natural size and colour.

4. *Tiaropsis oligoplocama*, n. sp. Natural size.

5. *Thaumantias helicobostrycha*, n. sp. Natural size.

6. Diagrammatic representation of the ovaries and nutrient tubes as they occur in a normal specimen of *Aurelia aurita*. The manubrium, which normally presents four lobes, has been removed.

7. Diagrammatic representation of a specimen of *A. aurita*, which presented an abnormal, though symmetrical, multiplication of parts—there being twelve complete segments instead of eight (as in fig. 6), and the manubrium, which is not shown, having presented six lobes instead of four.

8. Diagrammatic representation of an asymmetrical multiplication of parts in *A. aurita*. In this specimen the manubrium was bifid in the lobes which faced one of the multiplied segments.

9. Diagrammatic representation of an abnormal, though symmetrical, multiplication of nutrient tubes in *A. aurita*—those in every alternate segment having undergone duplication. In this instance the manubrium resembled the ovaries in not partaking of the duplication.

### Plate XVI.

Fig. 1. Diagrammatic representation of a specimen of *A. aurita*, resembling that figured in Pl. XV. fig. 9, except that one of the four normal quadrants of the umbrella has escaped the process of duplication.

2. Diagrammatic representation of an asymmetrical multiplication of parts n *A. aurita*, one of the four quadrants of the animal having become duplicated. In this instance, however, the manubrium was four-lobed.

3. Diagrammatic representation of another form of asymmetrical multiplication of parts in *A. aurita*, one of the four quadrants of the animal having become tripled. In this instance the lobe of the manubrium which faced the tripled quadrant of the umbrella was doubled.

4. Diagrammatic representation of an abortion of parts in *A. aurita*, one of the four quadrants of the animal having been suppressed. In this instance, however, the manubrium presented its normal number of lobes.

5. Diagrammatic representation of a still further abortion of parts in *A. aurita*, two of the four quadrants having been suppressed. In this instance also, the manubrium presented its normal number of lobes.